CLAIMS

1. An interface device for providing a gateway function between lines of a public switched telephone network (PSTN) that carry digital hierarchy signals in a plurality of digital hierarchies and an asynchronous transfer mode (ATM) backbone network that carries signals in ATM format, the interface device comprising:

a telephony transceiver operative to receive upstream digital hierarchy signals in a plurality of digital hierarchies from the PSTN;

a hierarchy converter operatively associated with the telephony transceiver and operative to convert at least some of said upstream digital hierarchy signals in a plurality of digital hierarchies to upstream signals in a single digital hierarchy distributed over a plurality of logical channels;

an inverse multiplexing unit operatively associated with the hierarchy converter and operative to inverse-multiplex said upstream signals in the single digital hierarchy distributed over a plurality of logical channels thereby to form upstream inverse-multiplexed digital hierarchy signals;

an ATM framer operatively associated with the inverse multiplexing unit and operative to map at least some of the upstream inverse-multiplexed digital hierarchy signals into ATM cells thereby to form upstream signals in ATM format; and

an ATM transceiver operatively associated with the ATM framer and operative to transmit said upstream signals in ATM format to the ATM backbone network.

2. An interface device according to claim 1 and wherein said digital

hierarchy signals in a plurality of digital hierarchies comprise at least one of the following: T1/E1 signals; T3/E3 signals; STS-N/STM-N signals, where N is an integer; and OC-M signals, where M is an integer.

3. An interface device according to claim 2 and wherein said telephony transceiver comprises at least one of the following: an optical carrier (OC) of level M (OC-M) transceiver, where M is an integer; a DS1 transceiver; and a DS3 transceiver.

4. An interface device according to claim 1 and wherein said hierarchy converter comprises at least one of the following: a demultiplexer; and a multiplexer.

5. An interface device according to claim 1 and wherein said inverse multiplexing unit comprises a plurality of inverse-multiplexers ATM (IMAs) each capable of multiplexing signals carried over a plurality of logical channels.

6. An interface device according to claim 1 and wherein said ATM transceiver comprises at least one of the following: an OC-M transceiver, where M is an integer; and an STS-N/STM-N transceiver, where N is an integer.

7. An interface device according to claim 1 and also comprising an ATM bus operatively associated with the inverse multiplexing unit and the ATM framer and operative to receive the upstream inverse-multiplexed digital hierarchy signals from the inverse multiplexing unit, and to provide the upstream inverse-multiplexed digital hierarchy signals to the ATM framer.

8. An interface device according to claim 7 and wherein the ATM framer is an ATM UTOPIA framer and the ATM bus comprises a multi-UTOPIA bus.

9. An interface device according to claim 1 and also comprising AAL1 circuitry for providing constant bit rate (CBR) services that require a timing relation between endpoints of connections.

10. An interface device according to claim 1 and also comprising Frame-Relay/ATM internetworking circuitry for interfacing to a Frame-Relay.

11. An interface device according to claim 1 and wherein at least one of the hierarchy converter and the telephony transceiver is operative to provide a series of digital hierarchy signals to the ATM framer, and said ATM framer is operative to map said series of digital hierarchy signals into ATM cells thereby forming a series of signals in ATM format.

12. An interface device for providing a gateway function between lines of a public switched telephone network (PSTN) that carry digital hierarchy signals in a plurality of digital hierarchies and an asynchronous transfer mode (ATM) backbone network that carries signals in ATM format, the interface device comprising:

an ATM transceiver operative to receive downstream signals in ATM format from the ATM backbone network;

an ATM UTOPIA framer operatively associated with the ATM transceiver and operative to map the downstream signals in ATM format into downstream digital hierarchy signals;

an inverse multiplexing unit operatively associated with the ATM framer and operative to inverse-demultiplex at least some of said downstream digital hierarchy signals thereby providing downstream signals in a single digital hierarchy distributed over a plurality of logical channels;

a hierarchy converter operatively associated with the inverse

multiplexing unit and operative to convert said downstream signals in a single digital hierarchy distributed over a plurality of logical channels to downstream digital hierarchy signals in a plurality of digital hierarchies; and

a telephony transceiver operatively associated with the hierarchy converter and operative to transmit said downstream digital hierarchy signals in a plurality of digital hierarchies to the PSTN.

13. An interface device according to claim 12 and wherein said digital hierarchy signals in a plurality of digital hierarchies comprise at least one of the following: T1/E1 signals; T3/E3 signals; STS-N/STM-N signals, where N is an integer; and OC-M signals, wherein M is an integer.

14. An interface device according to claim 13 and wherein said telephony transceiver comprises at least one of the following: an optical carrier (OC) of level M (OC-M) transceiver, where M is an integer; a DS1 transceiver; and a DS3 transceiver.

15. An interface device according to claim 12 and wherein said hierarchy converter comprises at least one of the following: a demultiplexer; and a multiplexer.

16. An interface device according to claim 12 and wherein said inverse multiplexing unit comprises a plurality of inverse-demultiplexers ATM each capable of demultiplexing signals carried over a plurality of logical channels.

17. An interface device according to claim 12 and wherein said ATM transceiver comprises at least one of the following: an OC-M transceiver, where M is an integer; and an STS-N/STM-N transceiver, where N is an integer.

18. An interface device according to claims 12 and also comprising an ATM bus operatively associated with the ATM framer and the inverse multiplexing unit and operative to receive the downstream digital hierarchy signals from the ATM framer, and to provide the downstream digital hierarchy signals to the inverse multiplexing unit.

19. An interface device according to claim 18 and wherein the ATM framer is an ATM UTOPIA framer and the ATM bus comprises a multi-UTOPIA bus.

20. An interface device according to claim 12 and also comprising AAL1 circuitry for providing constant bit rate (CBR) services that require a timing relation between endpoints of connections.

21. An interface device according to claim 12 and also comprising Frame-Relay/ATM internetworking circuitry for interfacing to a Frame-Relay.

22. A communication device comprising the interface device of claim 1.

23. A communication device comprising interface device of claim 12.

24. A communication network comprising a PSTN, an ATM backbone network, and the interface device of claim 1 operatively associated with the PSTN and the ATM backbone network.

25. A communication network comprising a PSTN, an ATM backbone network, and the interface device of claim 12 operatively associated with the PSTN and the ATM backbone network.

26. A communication apparatus comprising an ATM switch, a digital access cross-connect system (DACS), and the interface device of claim 1 operatively associated with the ATM switch and the DACS.

27. A communication apparatus comprising an ATM switch, a digital access cross-connect system (DACS), and the interface devices of claim 12 operatively associated with the ATM switch and the DACS.

28. Apparatus according to claim 26 and also comprising a SONET/SDH multiplexer operatively associated with the DACS and operative to provide to the DACS OC-M telephony signals, where M is an integer.

29. ATM switching fabric comprising a plurality of the interface device of claim 1, each of said plurality of the interface devices of claim 1 being operatively associated with the ATM switching fabric and an ATM backbone network.

30. ATM switching fabric comprising a plurality of the interface devices of claim 12, each of said plurality of the interface devices of claim 12 being operatively associated with the ATM switching fabric and an ATM backbone network.

31. A method for providing a gateway function between lines of a public switched telephone network (PSTN) that carry digital hierarchy signals in a plurality of digital hierarchies and an asynchronous transfer mode (ATM) backbone network that carries signals in ATM format, the method comprising:

receiving upstream digital hierarchy signals in a plurality of digital hierarchies from the PSTN;

converting at least some of said upstream digital hierarchy signals in a plurality of digital hierarchies to upstream signals in a single digital hierarchy distributed over a plurality of logical channels;

inverse-multiplexing said upstream signals in the single digital hierarchy distributed over a plurality of logical channels thereby forming upstream inverse-multiplexed digital hierarchy signals;

mapping at lease some of the upstream inverse-multiplexed digital hierarchy signals into ATM cells thereby forming upstream signals in ATM format; and

transmitting the upstream signals in ATM format to the ATM backbone network.

32. A method for providing a gateway function between lines of a public switched telephone network (PSTN) that carry digital hierarchy signals in a plurality of digital hierarchies and an asynchronous transfer mode (ATM) backbone network that carries signals in ATM format, the method comprising:

receiving downstream signals in ATM format from the ATM backbone network;

mapping the downstream signals in ATM format into downstream digital hierarchy signals;

inverse-demultiplexing at least some of said downstream digital hierarchy signals thereby providing downstream signals in a single digital hierarchy distributed over a plurality of logical channels;

converting said downstream signals in a single digital hierarchy distributed over a plurality of logical channels to downstream digital hierarchy signals in a plurality of digital hierarchies; and

transmitting said downstream digital hierarchy signals in a plurality of digital hierarchies to the PSTN.

33. A method according to claim 31 and also comprising the steps of:

receiving downstream signals in ATM format from the ATM backbone network;

mapping the downstream signals in ATM format into downstream digital hierarchy signals;

inverse-demultiplexing at least some of said downstream digital hierarchy signals thereby providing downstream signals in a single digital hierarchy distributed over a plurality of logical channels;

converting said downstream signals in a single digital hierarchy distributed over a plurality of logical channels to downstream digital hierarchy signals in a plurality of digital hierarchies; and

transmitting said downstream digital hierarchy signals in a plurality of digital hierarchies to the PSTN.

34. A method according to claim 31 and wherein the digital hierarchy signals in a plurality of digital hierarchies comprise at least one of the following: T1/E1 signals; T3/E3 signals; STS-N/STM-N signals, where N is an integer; and OC-M signals, where M is an integer.

35. A method according to claim 31 and wherein said converting step comprises the step of demultiplexing said at least some of said upstream digital hierarchy signals in a plurality of digital hierarchies thereby providing said upstream signals in a single digital hierarchy distributed over a plurality of logical channels.

36. A method according to claim 32 and wherein said converting step comprises the step of demultiplexing said downstream signals in a single digital hierarchy distributed over a plurality of logical channels thereby providing said downstream digital hierarchy signals in a plurality of digital hierarchies.

37. A method according to claim 32 and also comprising the step of mapping at least some of the upstream signals in a single digital hierarchy distributed over a plurality of logical channels into upstream AAL1 type signals.

38. A method according to claim 31 and also comprising the step of mapping at least some of the upstream signals in a single digital hierarchy distributed over a plurality of logical channels into upstream signals suitable for transmission over a Frame-Relay.

39. A method according to claim 32 and also comprising the step of mapping at least some of the downstream digital hierarchy signals into downstream AAL1 type signals.

40. A method according to claim 32 and also comprising the step of mapping at least some of the downstream digital hierarchy signals into downstream signals suitable for transmission over a Frame-Relay.